

REMARKS

Applicants respectfully request further examination and reconsideration in view of the arguments set forth fully below. Claims 1-40 were previously pending. Of the above Claims, Claims 8-10 were previously withdrawn from consideration. In the Office Action mailed September 7, 2004, Claims 1-7 and 11-40 have been rejected. By the above amendments, Claims 4, 5, 11, 18, 30 and 38 have been amended. Accordingly, Claims 1-7 and 11-40 are currently pending. Favorable reconsideration is respectfully requested in view of the remarks below.

Oath/Declaration

Within the Office Action, it is stated that “the oath or declaration is defective because: It does not have a dated signature for each inventor.” This is clearly an oversight, as the Applicants submitted a combined Declaration for Patent Application and Power of Attorney on June 15, 2001, in response to the Notice to File Missing Parts of Application mailed April 23, 2001, with a check in the amount of \$65.00. Enclosed is a copy of the combined Declaration for Patent Application and Power of Attorney submitted on June 15, 2001.

Claim Rejections Under 35 U.S.C. § 112

Within the Office Action, Claims 4-5, 11-22 and 30-35 have been rejected under 35 U.S.C. 112, second paragraph, “as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections.”

Specifically, it is stated that Claim 4 “omits structural cooperative relationships” even though the parity array is generated in claim 2 as a result of the parity calculation in and did not exist prior to that according to the claim language. The Applicants respectfully disagree with this rejection. However, to expedite the prosecution of the present application, the Applicants have amended Claim 4 by deleting the language “before the step of performing the parity calculation along the hyper diagonal is executed”.

Regarding Claim 5, it is stated that “there is insufficient antecedent basis for the limitation ‘the encoded block’ in the claim.” By the above amendment to Claim 5, appropriate corrections have been made.

Regarding Claim 11, it is stated that “the term ‘immediately’ is a relative term which renders the claim indefinite. The term is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and of ordinary skill in the art would not be reasonably apprised of the scope of the invention.” The Applicants respectfully traverse this rejection. The phrase “immediately” is described in the Specification in relation to an encoder that can encode the date “on the fly” without storing the entire block in storage. [Page 4, lines 30-31 of the Present Invention]. Such an encoder should have very low latency because it would not store the date bits. [Page 4, lines 31-32 of the Present Invention]. Prior art encoders have a high latency, because the encoder cannot output the data array until it finishes encoding both rows and columns. [Page 4, lines 15-17]. One of ordinary skill in the art would be reasonably apprised of the scope of the invention. Further, a search of the patent database from 1976 forward using the field code “ACLM/immediately” resulted in 60,992 issued patents. Thus, the phrase “immediately” is intelligible and capable of being understood in the context of the patent specification.

Also regarding Claim 11, it is stated that there is insufficient antecedent basis for the limitation “the updated second set” in line 15. By the above amendment to Claim 11, appropriate corrections have been made.

Regarding Claims 12 and 13, it is stated that “it is not clear whether the applicant is attempting to claim an alternative embodiment of claim 11 or whether the Applicant is claiming additional encoding schemes to supplement the three encoding devices in claim 11.” The Applicants are claiming an alternative embodiment of claim 11. [See page 9, line 28 to page 10, line 2; see, also, page 16, lines 11 to 14].

Regarding Claim 18, it is stated that “structural cooperative relationships are omitted, such omission amounting to a gap between the necessary structural connections.” The Applicants respectfully disagree with this rejection. However, to expedite the prosecution of the present application, the Applicants have amended Claim 18 by deleting the language “wherein the step of resetting is executed after the first set of encoded data is outputted”.

Regarding Claim 21, it is stated that the term “predetermined number of bits” is a relative term which renders the claim indefinite. The term “predetermined number of bits” is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.” The Applicants respectfully traverse this rejection. The term “predetermined number of bits” describes the number of parity array bits encoded for updating the hyper parity array which are determined by the information bits and the first set and the second set of encoded data for each row. One skilled in the art would recognize and know how to practice the claimed invention using a “predetermined number of bits” upon reading the specification. Further, a search of the patent database from 1976 forward using the field code “ACLM/predetermined” resulted in 531,551 issued patents. Thus, the phrase “predetermined number of bits” is intelligible and capable of being understood in the context of the patent specification.

Also regarding Claim 21, it is stated that “it is unclear what the Applicant means by rotating. Rotating is a geometric operation.” The Applicants respectfully traverse this rejection. Diagonalization is achieved by “rotating” the product code bits. One skilled in the art would recognize and understand what is meant by “rotating”.

Regarding Claim 30, it is stated that there is insufficient antecedent basis for the limitation “the encoded bits” in line 14. By the above amendment to Claim 30, appropriate corrections have been made.

Regarding Claim 38, it is stated that there is insufficient antecedent basis for the limitation “each diagonal encoded” in lines 3-4. By the above amendment to Claim 38, appropriate corrections have been made.

Claim Rejections Under 35 U.S.C. § 102

Claims 1-3, 5-7, 23-29, 37 and 38 have been rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5392299 issued to Rhines et al. (hereinafter “Rhines”). The Applicants respectfully traverse this rejection.

Rhines discloses a triple orthogonally interleaved error correction system to detect and correct errors in data transmissions through the use of relatively few error correction symbols in proportion to the amount of user data transmitted. The data stream to be transmitted or stored is encoded by a first error correction encoder to form a series of code words. The code words are input to an interleaver where the code words are

orthogonally interleaved. A second error correction encoder then encodes the series of code words. The code words are further processed by a second interleaver and subsequently encoded by a third error correction encoder. The triple orthogonally interleaved encoded data is then ready for transmission or storage through a chosen media channel. [Rhines, column 4, lines 16-33]. Rhines uses RAM to stores blocks and arrays. Rhines does not disclose turbo product codes (TPC). Rhines also does not utilize parity block codes or perform parity calculations along a hyperdiagonal. Instead, Rhines outputs symbols to the diagonal direction, as shown in Figure 5 of Rhines. As such, Rhines cannot teach adding parity results to a block of data.

In contrast to the teachings of Rhines, the method and apparatus of the present invention encodes hyper-product codes by diagonal encoding. A hyper encoder module receives a block of data. A row of the block is immediately output and encoded by a first module according to a first encoding scheme. A column is encoded by a second module according to a second encoding scheme. A second set of encoded data is generated, iteratively updated and output by the second module. The hyper encoder module hyper-diagonally encodes the information bits as described above and then outputs the encoded data. In one embodiment, a parity calculation is performed along a hyper diagonal in the block, wherein a parity result for the parity calculation is generated, and the parity result is added to the block of data. As described above, Rhines does not perform parity calculations, utilize parity block codes or add parity results to a block of data. Also, unlike the present invention, Rhines does not encode data without storing an entire block or array in storage. Instead, Rhines uses RAM to store arrays. Further, Rhines does not disclose or teach using turbo product codes.

The independent Claim 1 is directed to a method of encoding a block of data having n dimensions, wherein the block contains a plurality of systematic block code codewords. The method comprises the steps of performing a parity calculation along a hyper diagonal in the block, wherein a parity result for the parity calculation is generated; and adding the parity result to the block of data. As described above, Rhines does not teach performing a parity calculation along a hyper diagonal in the block, generating a parity result for the parity calculation or adding the result to a block of data. For at least these reasons, the independent Claim 1 is allowable over the teachings of Rhines.

Claims 2-3 and 5-7 are all dependent on the independent Claim 1. As discussed above, the independent Claim 1 is allowable over the teachings of Rhines. Accordingly,

the dependent Claims 2-3 and 5-7 are all also allowable as being dependent on an allowable base claim.

The independent Claim 23 is directed to an encoder. The encoder comprises a datapath module for encoding a block of data having a plurality of systematic block code codewords, wherein each codeword includes a plurality of information bits and a plurality of error correction bits, wherein the datapath module hyper-diagonally encodes a string of the block code codewords and performs a parity calculation on the string, whereby a parity result for each string is generated. As described above, Rhines does not teach hyper-diagonally encoding a string of codewords, performing a parity calculation, or generating a parity result. For at least these reasons, the independent Claim 23 is allowable over the teachings of Rhines.

Claims 24-29 are all dependent on the independent Claim 23. As discussed above, the independent Claim 23 is allowable over the teachings of Rhines. Accordingly, the dependent Claims 24-29 are all also allowable as being dependent on an allowable base claim.

The independent Claim 37 is directed to an encoder for encoding a block of data into an encoded block of data, the block of data having a plurality of information bits, wherein the encoder outputs the information bits immediately after receiving the information bits. The encoder comprises a first encoder module for encoding the information bits in a row of the block, wherein the first encoder generates a set of encoded row bits; and a second encoder module for encoding the information bits in a column of the block, wherein the second encoder module generates a set of encoded column bits according to the information bits in each row, wherein the second encoder updates the encoded column bits for each row encoded by the first encoder. As described above, Rhines does not teach immediately outputting information bits after receiving the bits. Instead, Rhines stores the bits in RAM before outputting the bits. For at least these reasons, the independent Claim 37 is allowable over the teachings of Rhines.

Claim 38 is dependent on the independent Claim 37. As discussed above, the independent Claim 37 is allowable over the teachings of Rhines. Accordingly, the dependent Claim 38 is also allowable as being dependent on an allowable base claim.

Claim Rejections Under 35 U.S.C. § 103

Claims 4, 11-22, 30-36 and 40 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Rhines. The Applicants respectfully traverse this rejection.

Claim 4 is dependent on the independent Claim 1. As discussed above, the independent Claim 1 is allowable over the teachings of Rhines. Accordingly, the dependent Claim 4 is also allowable as being dependent on an allowable base claim.

Claim 11 is directed to a method of encoding a block of data having n-dimensions received from an input source, the block containing a plurality of information bits. The method comprises the steps of receiving a row of the block and immediately outputting the row; encoding the information bits in the row, wherein a first set of encoded data is generated according to a first encoding scheme; outputting the first set of encoded data; encoding the information bits in a column according to a second encoding scheme, wherein a second set of encoded data is generated and iteratively updated according to the information bits in the row; hyper-diagonally encoding the information bits in the block according to a parity encoding scheme, wherein a hyper set of encoded data is generated according to the information bits in the row and column and the first and second sets of encoded data; outputting the second set of encoded data after all the information bits and all subsequent first sets of encoded data are outputted; and outputting the hyper set of encoded data. As described above, Rhines does not teach hyper-diagonally encoding the information bits in the block according to a parity encoding scheme. And, as recognized within the Office Action, Rhines does not teach use of a hyper set of encoded data generated based on second sets of data. For at least these reasons, the independent Claim 11 is allowable over the teachings of Rhines.

Claims 12-22 are all dependent on the independent Claim 11. As discussed above, the independent Claim 11 is allowable over the teachings of Rhines. Accordingly, the dependent Claims 12-22 are all also allowable as being dependent on an allowable base claim.

The independent Claim 30 is directed to an encoder for encoding a block of data having a plurality of information bits, wherein the encoder outputs the information bits immediately after receiving the information bits. The encoder comprises a first encoder module for encoding the information bits in a row of the block, wherein the first encoder generates a set of encoded row bits; a second encoder module for encoding the information bits in a column of the block, wherein the second encoder module generates a set of encoded column bits according to the information bits in each row, wherein the

second encoder updates the encoded column bits for each row encoded by the first encoder; and a hyper encoder module for hyper-diagonally encoding all information bits and all encoded bits diagonally along the block, wherein the hyper encoder generates a set of parity results, whereby each parity result corresponds to a diagonal of the encoded row bits and the encoded column bits. As described above, Rhines does not teach a hyper encoder module for hyper-diagonally encoding all information bits and all encoded bits diagonally along a block. Rhines also does not teach generating a set of parity results, whereby each parity result corresponds to a diagonal of the encoded bits. For at least these reasons, the independent Claim 30 is allowable over the teachings of Rhines.

Claims 31-35 are all dependent on the independent Claim 30. As discussed above, the independent Claim 30 is allowable over the teachings of Rhines. Accordingly, the dependent Claims 31-35 are all also allowable as being dependent on an allowable base claim.

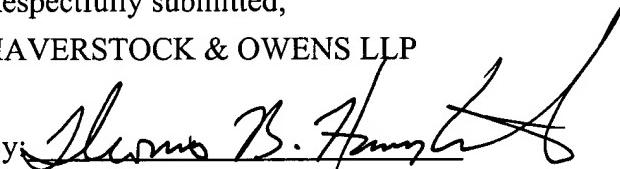
The independent Claim 36 is directed to an encoder for encoding a block of data into an encoded block of data, wherein the block of data having a plurality of information bits arranged in a plurality of rows and columns. The encoder comprises means for receiving the block of data, wherein the information bits received are immediately output by an output means; first means for encoding each row according to a first encoding scheme, wherein the first means generates a row encoding result for each row encoded by the first encoding scheme; second means for encoding each column according to a second encoding scheme, wherein the second means generates a column encoding result for each column encoded by the second encoded scheme, wherein the column encoding result is iteratively updated for each row encoded by the first means; and means for hyper-diagonally encoding along the encoded block of data, the means for hyper-diagonally encoding generating a hyper parity result for each corresponding diagonal in the encoded block of data. As described above, Rhines does not teach immediately outputting received information bits by an output means. Rhines also does not teach means for hyper-diagonally encoding along an encoded block of data or generating a hyper parity result for each corresponding diagonal in the encoded block of data. For at least these reasons, the independent Claim 36 is allowable over the teachings of Rhines.

Claim 40 depends on the independent Claim 36. As discussed above, the independent Claim 36 is allowable over the teachings of Rhines. Accordingly, the dependent Claim 40 is also allowable as being dependent on an allowable base claim.

PATENT
Attorney Docket No.:AHA-02101

Applicants respectfully submit that the Claims 1-7 and 11-40 are in a condition for allowance, and allowance at an early date would be appreciated. Should the Examiner have any questions or comments, the Examiner is encouraged to call the undersigned at (408) 530-9700 to discuss the same so that any outstanding issues can be expeditiously resolved.

Dated: 11-22-04

Respectfully submitted,
HAVERSTOCK & OWENS LLP
By: 
THOMAS B. HAVERSTOCK
Reg. No.: 32,571

NOV 26 2004

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name. I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled: ENHANCED TURBO PRODUCT CODES. The specification of which was filed March 14, 2001 as U.S. Patent Application Serial Number 09/808,884. I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Priority Claim

Prior Foreign Application(s)

Yes No

Number	Country	Day/Month/Year Filed
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I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status: Patented, Pending, Abandoned
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I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:

60/189,345 Application Serial No.	March 14, 2000 Filing Date
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I hereby appoint the following as my attorneys with full power of substitution to prosecute this application and transact all business in the Patent and Trademark Office in connection therewith:

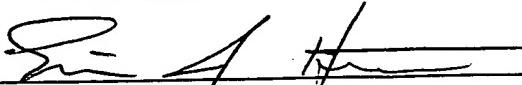
Thomas B. Haverstock	32,571	Jonathan O. Owens	37,902
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Please direct all correspondence regarding this application to the following:

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Palo Alto, California 94306

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY

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My residence, post office address and citizenship are as stated next to my name. I believe I am an original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled: ENHANCED TURBO PRODUCT CODES. The specification of which was filed March 14, 2001 as U.S. Patent Application Serial Number 09/808,884. I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

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Priority Claim

Prior Foreign Application(s)

Yes No

Number	Country	Day/Month/Year Filed
I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:		

Application Serial No.	Filing Date	Status: Patented, Pending, Abandoned
I hereby claim the benefit under Title 35, United States Code, § 119(c) of any United States provisional application(s) listed below:		
60/189,345 Application Serial No.	March 14, 2000 Filing Date	

I hereby appoint the following as my attorneys with full power of substitution to prosecute this application and transact all business in the Patent and Trademark Office in connection therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 101 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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